
Space Weather Technical Forecast

Issued on Friday, 23 August 2024 at 00:14 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales <https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales>

Space Weather Forecast Headline: Further R1/R2 flares likely, slight chance of isolated R3 flares.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity was Moderate, with one M-class flares recorded in the last 24 hours, the peak being an M1.5 flare from AR3796 at 22/1039UTC.

There are currently ten regions on the visible disc. The largest and most complex regions on the disc are AR3790 (Dhc/Bet-Gamma) and AR3796 (Eac/Beta-Gamma). AR3790 now west of centre disc in the south has shown some consolidation and growth in its lead and trailer portions, with similar evolution for AR3796 in the southeast. AR3799 (Dai/Beta) toward the east limb has shown further growth, with a trend toward increased magnetic complexity. The other sunspot regions are comparatively smaller or less complex, and mostly either stable or in slight decay. Any potential CME (Coronal Mass Ejection) glancing influence is now considered to have passed, with no other Earth directed CMEs evident in available imagery.

Solar Wind / Geomagnetic Activity: The solar wind, as measured by ACE at L1, was at background levels but with a gradual rising trend 300-390km/s. The density also showed a gradual rising trend from below average to above average levels, peaking near 19ppcc around 22/1800UTC, before reducing to below average again thereafter. The Interplanetary Magnetic Field, Bt, was mostly weak but became occasionally moderate in the UTC afternoon, peak 11nT. The north-south component, Bz, varied weakly between +8/-8nT but was often southward/negative during the first half of the period, then often northward/positive in the second half of the period. The phi angle was predominantly positive (away from the Sun). Geomagnetic activity was Quiet to Unsettled (Kp 1-3).

Energetic Particles / Solar Radiation: High energy (greater than 10 MeV) proton flux observed by GOES18 remained at background levels.

High energy electron flux (greater than 2MeV) observed at GOES16 was at generally background levels. The 24-hour fluence was below the Active threshold, with 9.32e5 integrated pfu observed at 23/0000UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: Further M-class flares are likely during the period with a slight chance of isolated X-flares.

Solar Wind /Geomagnetic Activity: Any potential CME (Coronal Mass Ejection) glancing influence is now considered to have passed, with no other Earth directed CMEs evident in available imagery.

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

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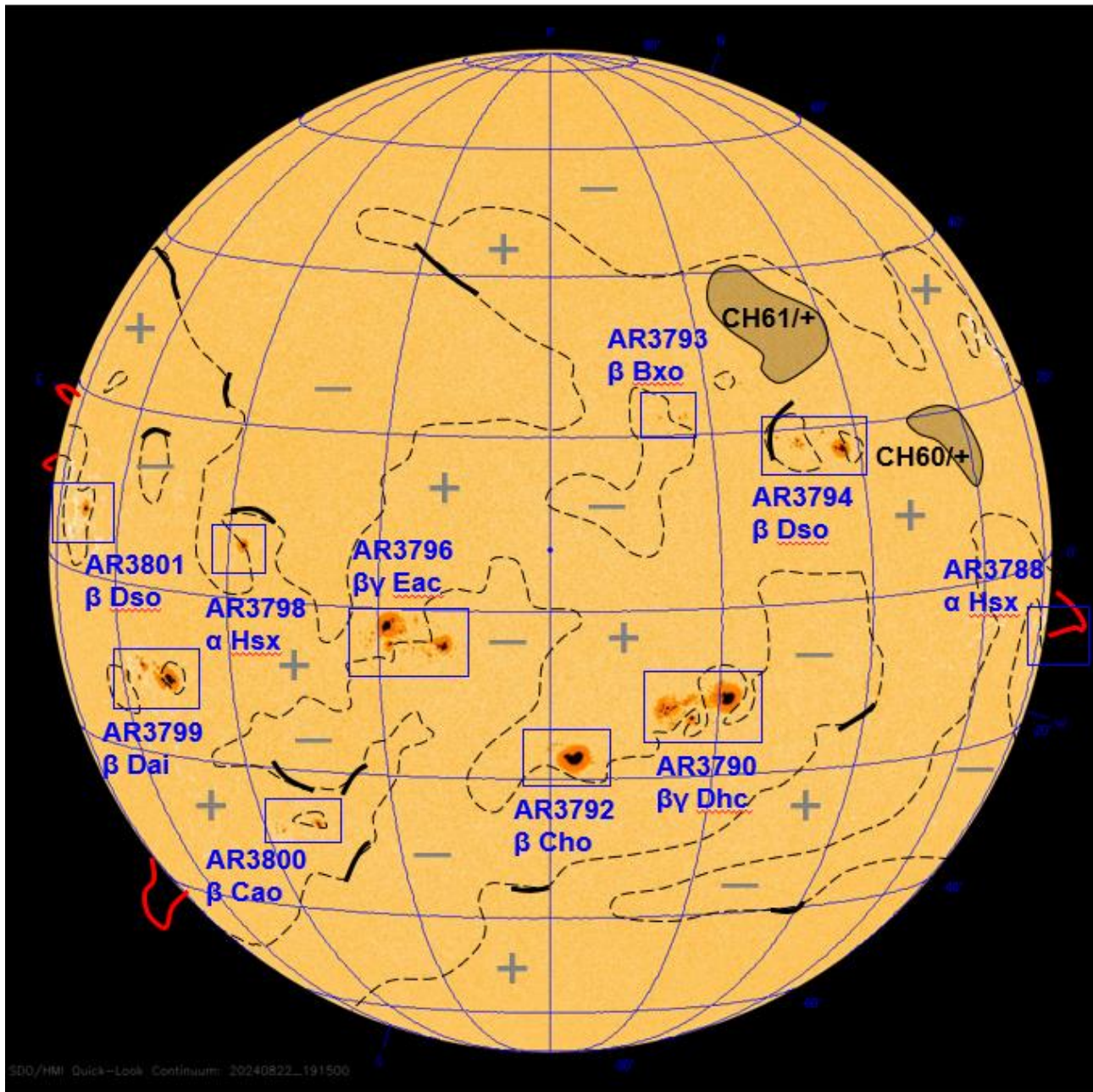
Background solar winds have shown a gradual upward trend through the period, which may indicate some weak HSS (High Speed Stream) influence. Further potential HSS influence from coronal holes CH60/+ and CH61/+ are likely into Day 1 (23 Aug) and perhaps lingering into Day 2 (24 Aug). Solar winds may increase further towards slightly elevated or possibly elevated levels, 400-500km/s, with any HSS influence then expected to wane thereafter.

Geomagnetic conditions are expected to be largely Quiet to Unsettled (Kp 1-3), but with a slight chance of isolated Active to G1/minor storm intervals (Kp 4-5) intervals on Day 1 and 2 (23 and 24 Aug), should we see any more significant coronal hole influence.

Energetic Particles / Solar Radiation: High energy proton flux is likely to remain at background levels, with a chance of exceeding the S1/Minor solar radiation storm level should any notable flares occur.

High energy electron flux is expected to remain at largely background levels. The associated 24-hour fluence is expected to be below the Active level but with a rising trend likely later in the period.

Figure 1. Solar Analysis Valid 22/1930UTC.



Key: Filament — , Prominence — , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α - β - $\beta\gamma$ - $\beta\gamma\delta$ and Zurich-McIntosh Axx etc.

Geomagnetic Storms:

Any potential CME (Coronal Mass Ejection) glancing influence is now considered to have passed, with no other Earth directed CMEs evident in available imagery.

Background solar winds have shown a gradual upward trend through the period, which may indicate some weak HSS (High Speed Stream) influence. Further potential HSS influence from coronal holes CH60/+ and CH61/+ are likely into Day 1 (23 Aug) and perhaps lingering into Day 2 (24 Aug). Solar winds may increase further towards slightly elevated or possibly elevated levels, 400-500km/s, with any HSS influence then expected to wane thereafter.

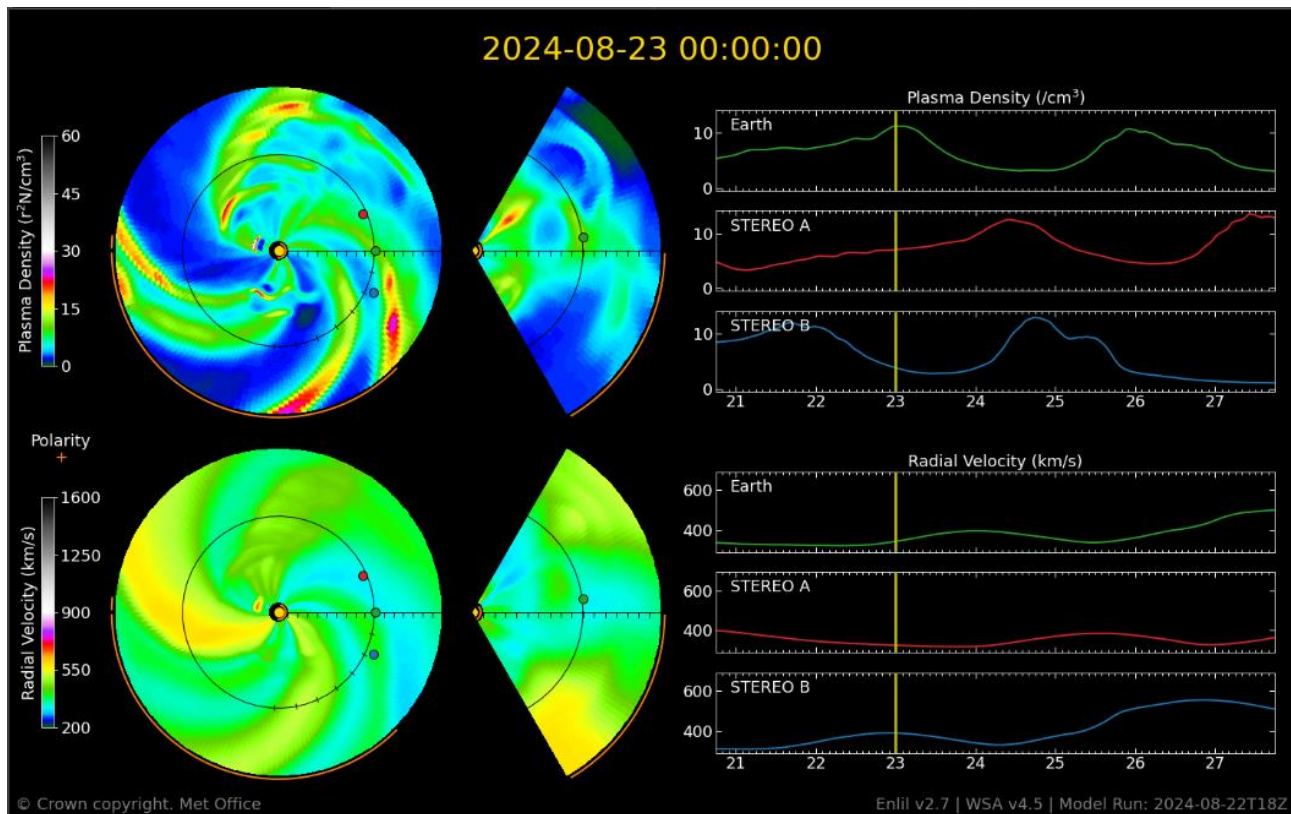
Geomagnetic conditions are expected to be largely Quiet to Unsettled (Kp 1-3), but with a slight chance of isolated Active to G1/minor storm intervals (Kp 4-5) intervals on Day 1 and 2 (23 and 24 Aug), should we see any more significant coronal hole influence.

Geo-Magnetic Storm	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Minor or Moderate	G1 to G2	No	15	10	5	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections

None currently expected.

Figure 2: Latest MOSWOC Enlil model output.



Radio Blackouts - X-Ray Flares:

Further M-class flares are likely given the number and complexity of active regions on the disc, with a slight chance of isolated X-class flares. The bulk of the flare risk originating now from AR3790 and AR3796, with AR3799 also showing an increased risk as it continues to slowly grow. Currently no significant new regions signalled to arrive over the eastern horizon from far-side soundings or persistence.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	Yes	70	70	70	70
Very Active	R3 to R5 X Class	No	10	10	10	10

Solar Radiation Storms - (High Energy Protons):

High energy proton flux at GOES18 is likely to persist at background levels, but with a chance of rising in response to any notable flares.

Ex-AR3784 beyond the western limb is still the main region of interest for proton flux risk at present, but this risk slowly reducing once it gets well past the limb later in this period. However, AR3790, and increasingly AR3796, are rotating onto the western disc, with a gradually increasing risk of proton events from these features which will largely balance the reducing ex-AR3784, resulting in a generally steady risk.

Radiation Storms	Level ($\text{cm}^{-2} \text{sr}^{-1} \text{s}^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	$\geq \text{S1}$	No	20	20	20	20
Very Active	$\geq \text{S3}$ *	No	5	5	5	5

* S3 $\geq 10 \text{ MeV} \geq 1000 \text{ pfu}$ and / or $\geq 50 \text{ MeV} \geq 10 \text{ pfu}$. (pfu = $\text{cm}^{-2} \text{sr}^{-1} \text{s}^{-1}$)

High Energy Electrons Event ($\geq 2 \text{ MeV}$):

Current predominantly background electron flux levels are considered likely to continue albeit with a likely rising trend due to potential HSS (High Speed Stream) influence, with an increase to near high diurnal levels possible later in the period.

Fluence is expected to remain below the Active ($1\text{e}8$ integrated pfu) through the period but with a rising trend expected. MOSWOC REFM looks to be providing reasonable guidance.

GEO Electron Environment	Level ($\text{cm}^{-2} \text{sr}^{-1} \text{day}^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	$\geq 2 \text{ MeV}$ $\geq 1 \times 10^8$	No	1	5	10	10
Very Active	$\geq 2 \text{ MeV}$ $\geq 1 \times 10^9$	No	1	1	1	1

Figure 3: Latest MOSWOC REFM output.

